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Patent
Attorney Docket No. GEMS8081.255

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Dean et al.
Serial No. : 10/065,247
Filed : September 27, 2002
For : Embedded Thermal Control System for High Field MR
Scanners :
Group Art No. : 2123
Examiner : Jaworski, F.

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

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REQUEST FOR PRE-APPEAL BRIEF CONFERENCE

Dear Sir:

A Notice of Appeal is filed concurrently herewith. Applicant hereby requests pre-appeal review of the final rejection in the above-identified application. No amendments are being filed with this request. The review is requested for the reasons set forth below.

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REMARKS

Claims 1-17 are pending in the present application. In the Advisory Action, mailed November 16, 2005, the Examiner maintained a rejection of claims 1, 2, 5, and 6 under 35 U.S.C. §102(e) as being anticipated by Ishihara et al. (USP 5,916,161). The Examiner stated that "the reference structure is capable of performing (sic) to adjust gradient coil power in response to sensed thermal control input." ADVISORY ACTION, Nov. 16, 2005, p. 2 (emphasis added). Applicant believes that the Examiner's rejection is not only clearly in error factually, but is also legally incorrect. Accordingly, this matter is believed to be correctly decided by a Pre-Appcal Brief Conference.

First, Ishihara et al. cannot anticipate claims 1, 2, 5, and 6 under 35 U.S.C. §102(e) when it is only alleged to merely "being capable of performing" that called for in the claims. Ishihara et al. does not teach or disclose that which is called for in the claims. At best, Ishihara et al. can only be applied in a rejection under 35 U.S.C. §103(a). Nevertheless, there is no disclosure in Ishihara et al. to adjust gradients in response to temperature. In fact, Ishihara et al. leads those skilled in the art to conclude that only RF pulse adjustment is needed. Therefore, one skilled in the art would be led away from the invention by Ishihara et al. That is, Ishihara et al. teaches away from the claimed invention by teaching that RF pulse sequence adjustment is sufficient for thermal control in an MRI application. Applicant hereby requests panel review of the rejection of claims 1, 2, 5, and 6 under 35 U.S.C. §102(e) as being anticipated by Ishihara et al.

It is clear that the Ishihara et al. teaches adjustment of the RF pulses of a pulse sequence – not the gradient pulses. Ishihara et al. states that "it is therefore an object of the present invention to provide a magnetic resonance imaging apparatus capable of measuring a temperature increase due to an application of RF magnetic fields for data acquisition purpose..." ISHIHARA ET AL., col. 1, line 66 – col. 2, line 2. The reference also discloses that "as for the manner of changing the pulse sequence, the first things to do is to suppress the pulse power and to increase the pulse application time

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span." ISHIHARA ET AL., col. 16, lines 35-37. Ishihara et al. next discloses that "it is also possible to reduce a number of RF pulses to be applied, or to widen the RF pulse application interval." ISHIHARA ET AL., col. 16, lines 37-29. The reference then teaches that "in a case of changing the RF pulse power, etc., automatically, it is necessary that an operator enters the current RF pulse input power (input voltage), application interval, application period, and pulse waveform, or these factors are measured automatically, or else these factors are read out from a file storing these factors in advance." ISHIHARA ET AL., col. 16, lines 55-60.

In fact, to conclude that Ishihara et al. is not limited to adjustment or control of the RF pulses is to ignore the very problem that the technique of Ishihara et al. is designed to address. In the Background of the Invention section of the reference, Ishihara et al. goes to great length to expound upon the effects of the application of RF power onto a living body. Specifically, Ishihara et al. states "when many RF magnetic fields are applied according to this imaging method, a temperature inside a living body increases due to the induced heating phenomenon." ISHIHARA ET AL., col. 1, ll. 20-23. The reference then describes the history of the U.S. Food and Drug Administration implementation of safety standards for MRI studies in 1982. Specifically, the reference discloses that the FDA recommended "to limit an application of RF power onto a living body according to the specific absorption rate (SAR)." ISHIHARA ET AL., col. 1, ll. 28-29. As a result, guidelines were established that not only defined SAR limits, but also body temperature limits. See ISHIHARA ET AL., col. 1, ll. 29-40. Ishihara et al., however, recognized a problem with then-conventional MR scans because "after the RF power is determined according to the SAR prior to the pulse sequence execution, the pulse sequence is executed regardless of a heat generation state of a body to be examined so that it has been impossible to confirm the safety of a body to be examined." ISHIHARA ET AL., col. 1, ll. 41-45. Accordingly, Ishihara et al. developed a technique to take the heat generation of the body into consideration and, in this regard, stated that "it is therefore an object of the present invention to provide a magnetic resonance imaging apparatus capable of measuring a temperature increase due to an application of

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RF magnetic fields for data acquisition purpose...” ISHITHARA ET AL., col. 1, l. 66 – col. 2, l. 2. As such, the reference’s teaching of pulse sequence adjustment is clearly directed to adjustments of the RF pulses of the pulse sequence, not the gradient pulses. There is no disclosure, or even the suggestion, to limit or control power to the gradient coils based on thermal conditions, as presently claimed.

In contrast, claim 1 is directed to a thermal control system that has “a thermal controller adapted to set at least one dynamic limit on a power input into at least one gradient coil of the MRI, said at least one dynamic limit being a function of the initial bore condition and the thermal boundary condition.” In other words, the thermal controller is configured to dynamically and intelligently set a limit on the power that can be applied to a gradient coil of an MRI apparatus – not the RF coils of an MRI apparatus. One skilled in the art will appreciate that a gradient coil is a wire conductor that is used to produce a linear magnetic field, i.e., gradient magnetic field, that is superimposed on the main magnetic field. RF coils are not interchangeable with the gradient coils.

The gradient pulse, for the driving of the gradient coil, is not the same as the RF pulse referenced by Ishihara et al. The “pulse power” referenced by Ishihara et al. is directed to the amount of RF energy that is deposited within the imaging volume. Gradient pulse power, on the other hand, is indicative of the strength of the gradient magnetic field that is superimposed on the main magnetic field. Accordingly, Ishihara et al. fails to teach or suggest a thermal controller that sets a dynamic limit on the power input to a gradient coil of an MR system that is a function of an initial bore temperature and a thermal boundary condition, as called for in claim 1. While the Examiner stated that the reference structure is capable of performing to adjust gradient coil power in response to sensed thermal control input, such is not taught or even suggested in Ishihara et al. In contrast, one skilled in the art, would be led to believe that only RF pulse adjustment is needed -- there is no other disclosure in the reference to lead one to adjust power to the gradient coil. Therefore, it is believed that claims 1-2 and 5-6 call for subject matter that is patentably distinct from that disclosed by Ishihara et al.

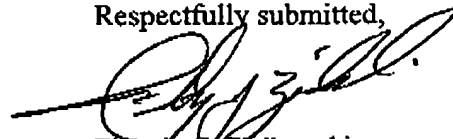
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Therefore, in light of at least the foregoing, Applicant respectfully requests reversal of the Examiner's rejections and timely issuance of a Notice of Allowance for claims 1-17.

Applicant appreciates the panel's review and cordially invites the panel members to call the undersigned, should they consider any matters unresolved.

Respectfully submitted,



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